



Important information

The *Condingup Water Reserve drinking water source protection plan* (2008, WRP no.95) was reviewed in 2017.

Please ensure you read the *Condingup Water Reserve drinking water source protection review* (2017, WRP no.164) alongside the 2008 plan to obtain all of the information about this drinking water source.

The 2017 review considers changes that have occurred in and around the Condingup Water Reserve since the completion of the 2008 *Condingup Water Reserve drinking water source protection plan*. Additional recommendations have been prepared to ensure the ongoing protection of this public drinking water source area:

- amending the reduced boundary under the *Country Areas Water Supply Act 1947 (WA)*
- priority areas have been amended to reflect the zoning in the current local planning scheme and existing land uses
- potential expansion to the north and north-west is proposed to be investigated.

You can find the *Condingup Water Reserve drinking water source protection review* at www.dwer.wa.gov.au or by contacting the Department of Water and Environmental Regulation on +61 8 6364 7000 or drinkingwater@dwer.wa.gov.au.



Department of Water
Government of Western Australia

Looking after all our water needs



Condingup Water Reserve drinking water source protection plan

Condingup town water supply



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Department of Water

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For more information about this report, contact the Department of Water officers listed above, the Water Source Protection branch or send your query to <drinkingwater@water.wa.gov.au>.

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Preface

The Department of Water has prepared this drinking water source protection plan to assess risks to water quality within the Condingup Water Reserve and to recommend management strategies to avoid, minimise or manage those risks. The department is committed to protecting drinking water sources to meet public health requirements and ensure the supply of safe, good quality drinking water to consumers.

The *Australian drinking water guidelines* recommend a risk-based, multiple barrier approach to protect public drinking water sources. Catchment protection is the first barrier, with subsequent barriers implemented at the water storage, treatment and distribution stages of a water supply system. Catchment protection requires an understanding of the catchment, the hazards and hazardous events that can compromise drinking water quality, and development of preventative strategies and operational controls to ensure the safest possible water supply.

This plan details the location and boundary of the drinking water catchment that provides potable water to the town of Condingup. It discusses existing and future use of the water source, describes the water supply system, identifies risks and recommends management approaches to address these risks and maximise protection of water quality in the Condingup Water Reserve.

This plan should be used to guide state and local government land use planning decisions. It should be recognised in the Shire of Esperance's *Town planning scheme*, consistent with the Western Australian Planning Commission's *Statement of planning policy: Public drinking water source policy*. Other stakeholders should use this document as a guide for protecting the quality of water supplied to consumers in Condingup.

The stages involved in preparing a drinking water source protection plan are:

Stages in development of a plan		Comment
1	Prepare drinking water source protection assessment.	Prepared following catchment survey/information gathering and based on published data.
2	Conduct stakeholder consultation.	Advice sought from key stakeholders using the assessment as a tool for information and discussion.
3	Prepare draft drinking water source protection plan.	Draft plan developed taking into account input from stakeholders and any additional advice received.
4	Release draft drinking water source protection plan.	Draft plan released for a six-week public consultation period.
5	Publish approved drinking water source protection plan.	Final plan published after considering advice received in submissions. Includes recommendations on how to protect water quality.

Summary

Condingup is a small town and agricultural service centre in the Great Southern region of Western Australia, approximately 65 kilometres east of Esperance. Condingup obtains its water from production bore 6/83 in the centre of town, drawing water from a shallow and unconfined to semi-confined aquifer. As such, best practice measures are required to protect Condingup's drinking water source from contamination that may result from activities and possible future land use development in the town.

Production bore 6/83 was originally a water source for the adjacent Condingup Primary School and was acquired as part of the Commonwealth Government's Country Water Supply Improvement Program in 1990. In 1995 Condingup Water Reserve was proclaimed (under the *Country Areas Water Supply Act 1947*) for the purpose of protecting the drinking water source from contamination. The *Condingup Water Reserve drinking water source protection assessment* was published in 2004 (Water Corporation 2004a) as a precursor to this plan.

The water quality at Condingup in 2008 has not changed significantly since 2004, with slightly elevated levels of salinity occasionally recorded from the production bore. Water drawn from the production bore is treated before being distributed to consumers in order to meet *Australian drinking water guidelines* (see Section 2 and Appendix A).

In general, the land uses and activities currently occurring in Condingup are compatible with the water reserve and maintaining the supply of good quality drinking water to Condingup. One of the key aspects of this plan is the establishment of priority classification areas and a wellhead protection zone to help protect water quality now and in the future. The proposed priority classifications for the water reserve are based on the various land uses and activities within the reserve (section 4.3 and Figure 4).

The plan also recommends that a hydrogeological study be undertaken to consider whether the water reserve corresponds with the recharge of the current production bore and possible future bores and to make any adjustments that may be necessary to the water reserve boundary (Section 4.2 and Recommendation 7).

1 Drinking water source overview

Condingup is approximately 665 kilometres (km) south-east of Perth in the Shire of Esperance and about 65 km east of Esperance. Condingup has a population of approximately 150, and provides a small service centre for local primary industry. There is also some tourist activity, given that Condingup is the closest town to the Duke of Orleans Bay, a popular holiday location, and in close proximity to Cape Arid and Israelite Bay.

1.1 Existing water supply system

Approximately 45 services are supplied with drinking water in Condingup, with total average annual consumption of slightly over 10 000 kL per year between 1999 and 2003 (Water Corporation 2004a). Subsequently, consumption peaked at 13 585 kL per year in 2004; and dropped to 9 209 and 9 970 kL per year in 2005 and 2006 respectively (as per Water Corporation water allocation licence annual reporting).

Groundwater is extracted from the Water Corporation production bore 6/83 in the centre of town (Figure 2). Water is abstracted from approximately 18 m to 30 m below ground level, then pumped to a nearby elevated service tank from where it is gravity-fed to the town's reticulated supply system (Water Corporation 2004a).

1.2 Water treatment

The extracted raw water is chlorinated before being supplied to the town. This provides a disinfection barrier against possible microbiological contamination.

It should be recognised that although treatment and disinfection are essential barriers to ensure a safe, good quality drinking water supply, catchment management is the fundamental first barrier for protecting water quality. This approach is endorsed by the Australian drinking water guidelines (ADWG) (NHMRC & NRMCC 2004a) and reflects a risk-based, catchment to consumer, multiple-barrier approach for providing safe drinking water to consumers. The combination of catchment protection and treatment delivers a safer drinking-water source than either barrier could achieve individually.

1.3 Catchment details

1.3.1 Physiography

The area is characterised by a relatively flat sandplain and low plateaus over granitic rocks. To the south and south-east of Condingup townsite there are two granitic peaks with elevations of 154 m and 168 m above sea level, respectively. The taller peak is commonly known as Condingup Peak.

1.3.2 Climate

Condingup has a temperate climate, experiencing warm dry summers and cool wet winters. The closest official rainfall data to Condingup is for Esperance, which has a long-term annual average of 611 millimetres.

1.3.3 Hydrogeology

The main aquifer in the Condingup area is contained in tertiary sedimentary rock (the Plantagenet Group). Production bore 6/83 draws from fractured porous rock (spongolite, a form of soft siltstone) within this aquifer. The current hydrogeological data indicates that the direction of groundwater flow in the aquifer is from the north–northwest to the south–southeast (Water Corporation 2001).

Two other geological units containing groundwater occur in the Condingup area. These units are isolated pockets of Esperance Sandplain superficial sediments and fractured granitic bedrock.

There are two peaks (150 m to 170 m above sea level) within the water reserve located on crown land south of the Condingup townsite. It is understood that groundwater in the area is recharged by runoff from these peaks following high rainfall, usually in winter (Water Corporation 2001).

1.4 Future water supply requirements

In 1996 a plan was adopted by the Shire of Esperance to accommodate the future growth of Condingup, and in 2003 the plan was publicly displayed again. This plan makes provision for additional residential, industrial and special rural development, new road construction and a possible expansion of tourism (Shire of Esperance 2007.)

The town's current production bore is already at full capacity. Accordingly, any increased demand for drinking water will need to be resolved before future development can occur in Condingup.

In 2001 the Water Corporation undertook a drilling program in the Condingup area. The findings of this program indicated that there were no substantial resources of fresh groundwater within a 15 km radius of Condingup, and that water resources closer to Condingup are unsuitable due to being brackish to saline (Water Corporation 2001).

The *Condingup Water Reserve drinking water source protection assessment* (Water Corporation 2004) discussed a proposal for a second production bore to supplement water supplied from the existing bore. Water drawn from the second bore would require desalination prior to being distributed to consumers. Any future production bores should be located within a Priority 1 classification area (Section 4.3), that is,

well removed from land uses and activity that may be a contamination risk to the water source.

1.5 Protection and allocation

1.5.1 Existing water source protection

Condingup Water Reserve was proclaimed in 1995 under the *Country Areas Water Supply Act 1947*, for the purpose of protecting the public drinking water source. The water reserve is shown in Figure 2.

Given the shallow and unconfined to semi-confined nature of the aquifer, particular attention needs to be given to protecting this groundwater source. Protection measures that are already in place include fencing, signage and surveillance patrols of the production bore and its immediate surroundings.

1.5.2 Current allocation licence

Water resource use and conservation in Western Australia is administered by the Department of Water in accordance with the *Rights in Water and Irrigation Act 1914*. Under the Act, the right to use and control surface and groundwater is vested with the Crown. This act requires licensing of groundwater abstraction within proclaimed groundwater areas.

The Condingup Water Reserve is part of the Condingup groundwater area, proclaimed under the *Rights in Water and Irrigation Act 1914* in 1995. The Water Corporation can abstract up to 10 000 kL per year from the Condingup production bore, as per their current licence for this purpose issued under the *Rights in Water and Irrigation Act 1914*.

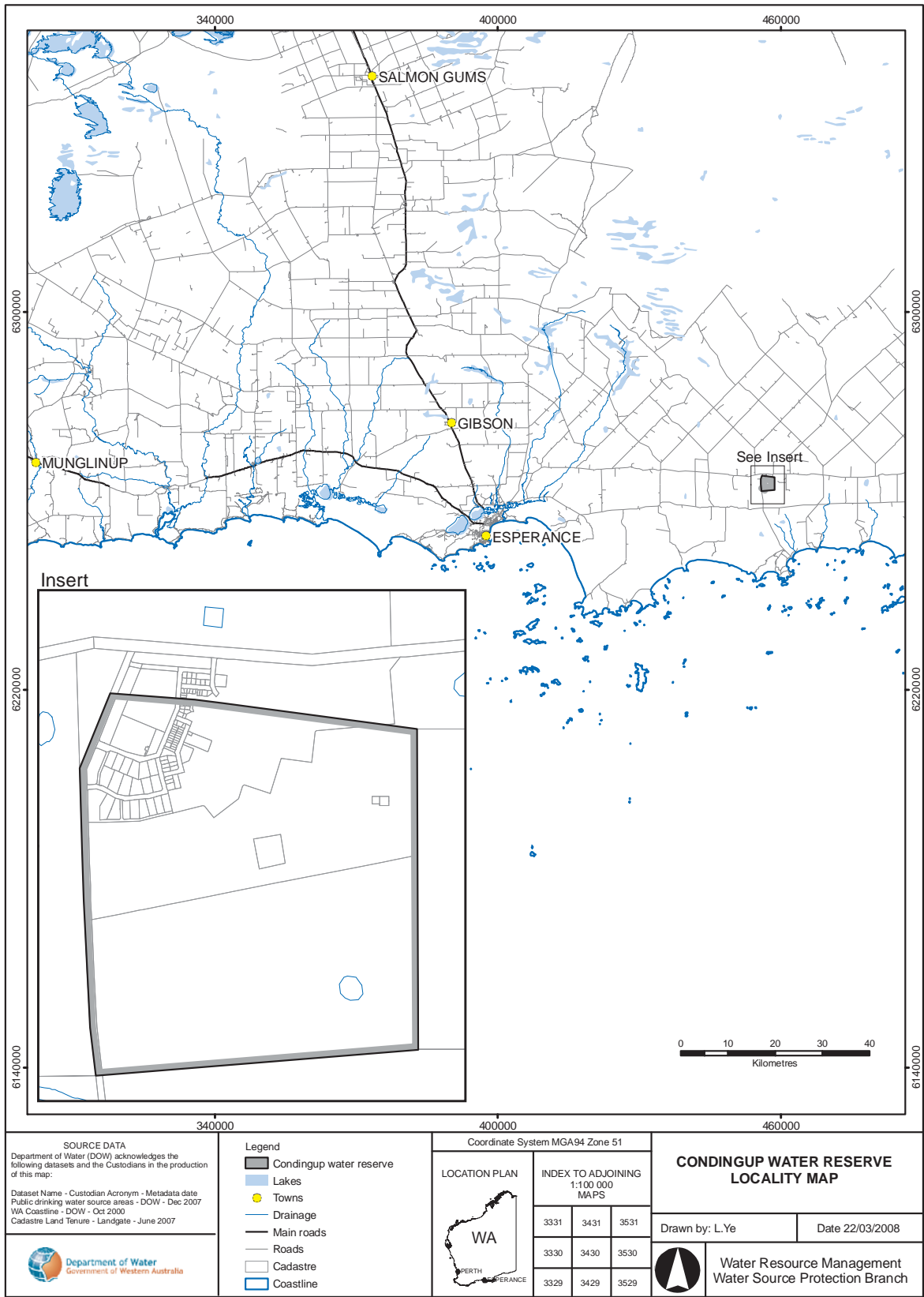


Figure 1 Condingup Water Reserve locality map



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Figure 2 Condungup Water Reserve

2 Water quality monitoring and contamination risks

A wide range of chemical, physical and microbiological properties can impact on water quality and therefore affect the provision of safe, good quality, aesthetically acceptable drinking water to consumers.

The Water Corporation regularly monitors the raw water quality from the Condingup Water Reserve for microbiological contamination, health related and aesthetic (non-health related) characteristics in accordance with the ADWG. Monitoring results are reviewed by an intergovernmental committee, chaired by the Department of Health, called the Advisory Committee for the Purity of Water.

A water quality summary for the Condingup Water Reserve from April 2003 to April 2008 is presented in Appendix A. An explanation of typical drinking water quality parameters is provided in sections 2.1, 2.2 and 2.3. For more information on water quality, see the Water Corporation's most recent drinking water quality annual report at <www.watercorporation.com.au> Water > Water quality > Downloads.

There is a low degree of contamination risk to Condingup Water Reserve (Table 1). Most of the water reserve is rural land used for broadacre agriculture or crown land containing remnant local native vegetation. Given that these agricultural land uses (mostly cattle grazing and silviculture) are down-gradient and a considerable distance from the drinking water production bore, there are minimal risks associated with fertiliser and pesticide/herbicide use.

2.1 Microbiological contaminants

Pathogens are types of micro-organisms that are capable of causing diseases. These include bacteria, protozoa and viruses. In water supplies, pathogens that can cause illness are mostly found in the faeces of humans and domestic animals.

Pathogens may enter a water source through activities involving direct contact of people and domestic animals with the main water body or its tributaries (such as fishing, marroning and swimming). This primarily occurs through the direct transfer of faecal material (even a very small amount can cause contamination), or indirectly through runoff moving faecal material into the water.

There are a number of pathogens that are commonly known to contaminate water supplies worldwide. These include bacteria (for example, *Salmonella*, *Escherichia coli* and *Cholera*), protozoa (for example, *Cryptosporidium*, *Giardia*) and viruses. *Escherichia coli* counts are a way of measuring these pathogens and are an indicator of faecal contamination.

The effect on people consuming drinking water that is contaminated with pathogens varies considerably, ranging from mild illness (such as stomach upset or diarrhoea)

to death. In Walkerton, Canada in 2000, seven people died due to contamination by a pathogenic strain of *Escherichia coli* and *Campylobacter* in the town groundwater source and supply (NHMRC & NRMMC 2004b).

Preventing the introduction of pathogens into the water source is the most effective barrier in avoiding this public health risk. In general, the Condingup drinking water supply has a low risk of microbiological contamination due to being drawn from groundwater.

2.2 Health related characteristics

A number of chemicals (organic and inorganic) are of concern in drinking water from a health perspective because they are potentially toxic to humans. In drinking water sources, chemicals usually occur attached to suspended material, such as soil particles, and may result from natural leaching from mineral deposits or from different land uses (NHMRC & NRMMC 2004b).

Pesticides include agricultural chemicals such as insecticides, herbicides, nematicides (used to control nematodes), rodenticides and miticides (used to control mites). Contamination of a drinking water source by pesticides may occur as a result of accidental spills, incorrect use or overuse and leakage from storage areas. In such cases, prompt action is required to notify relevant authorities and clean up the spill.

Nutrients (such as nitrogen) can enter drinking water supplies from leaching of fertiliser, from septic tanks and from faeces of grazing and domestic animals. Nitrate and nitrite (ions of nitrogen) can be toxic to humans at high levels, with infants less than three months old being most susceptible (NHMRC & NRMMC 2004a).

Hydrocarbons (for example, fuels, oils) are potentially toxic to humans, and harmful by-products may be formed when they are combined with chlorine in water treatment processes. Hydrocarbons can occur in water supplies from pollution events from vehicle accidents, refuelling and leakage from storage areas.

None of the health related parameters measured at Condingup have exceeded ADWG health guideline values.

2.3 Aesthetic characteristics

Impurities in drinking water can affect the aesthetic qualities of water such as its appearance, taste, smell and feel. Such impurities are not necessarily hazardous to human health; for example, water that is cloudy and has a distinctive colour may not be harmful (NHMRC & NRMMC 2004b).

Iron and dissolved organic matter can affect the colour and appearance of water, and salinity can affect the taste. The ADWG set limits on water quality characteristics to meet the aesthetic requirements of consumers.

Some properties such as pH (a measure of acidity or alkalinity) can contribute to the corrosion and encrustation of pipes. The ADWG also set out aesthetic guidelines for these types of water quality characteristics.

2.4 Groundwater bores

Under the provisions of sections 26D and 5C of the *Rights in Water and Irrigation Act 1914*, a licence is required to construct a bore or extract water (unless exempt under the *Rights in Water and Irrigation Act 1914 Exemption and Repeal (Section 26C) Order 2001*) within a proclaimed groundwater area. The Condingup Water Reserve is located within the Condingup groundwater area.

Any bores drilled near to a public drinking water supply bore have the potential to contaminate the drinking water source. For example, a poorly constructed bore may introduce contaminants through surface leakage down the outside of the bore casing into an otherwise uncontaminated aquifer. If a public drinking water source bore is being used nearby, it may abstract some of the contaminated water.

It is important to ensure that any bores are appropriately located and constructed in order to prevent contamination and other impacts on the public drinking water source. This will be assessed through the Department of Water's water licensing process where applicable under the *Rights in Water and Irrigation Act 1914*.

All bores should be constructed in accordance with *Minimum construction requirements for water bores in Australia* (National Minimum Bore Specifications Committee 2003).

3 Land use assessment

3.1 Existing land uses and activities

Current and proposed land uses and activities within Condingup Water Reserve are outlined below. This information is expanded on in Table 1, which also provides recommended protection strategies for risks to water quality.

3.1.1 Townsite

The Condingup townsite is located in the north-western corner of the water reserve. The townsite contains a number of 1 000 square metre residential lots, and some rural residential lots (minimum size 1 hectare) (R. Hindley 2008, pers. comm., 20 March). In addition, a primary school, sporting and community facilities, some light industry and a tavern/general store are within the townsite.

Most of these land uses and activities, which includes fuel storage at the general store and shire depot, are either down-gradient of the direction of groundwater flow to the current production bore or well removed from it. The exceptions to this, are the adjacent school, and a small light industrial area approximately 700 m up-gradient of the production bore (Table 1, Section 4.4 and Recommendation 1).

3.1.2 Crown land including current landfill and telecommunications

There are two large parcels of crown land within the water reserve (Figure 3). Both of these areas largely comprise remnant local native woodland and heath vegetation. Generally, the vegetation is in very good condition and the density of its ground coverage is high.

In addition to their intrinsic ecological values, these stands of native vegetation provide considerable protection to groundwater in the Condingup Water Reserve.

The parcel in the north-west of the water reserve surrounds the townsite, including the drinking water production bore. The other parcel of crown land (south of the town) contains two peaks approximately 150 m to 170 m above sea level. The taller southernmost peak is known as Condingup Peak; the other peak houses a telecommunications tower.

The town's current landfill site, operated by the Shire of Esperance, is on a plateau between the two peaks. It is located approximately 1.2 km south-east of the production bore, down-gradient of the direction of groundwater flow to the bore. As such, it is not expected to impact on the town's current water supply. Furthermore, site operations are required to comply with Department of Environment and Conservation licensing, including the operation of monitoring bores to detect any leachate from the site.

3.1.3 Agricultural

The predominant land use in and around the Condingup Water Reserve is broadacre agriculture comprising Tasmanian blue gum plantations (silviculture), low intensity grazing particularly of cattle and some cropping. Given that agriculture in the area is a considerable distance to the south of the Condingup's production bore, and down-gradient from it, it is unlikely to have any influence the town's drinking water source.

3.1.4 Decommissioned landfill

This former landfill site is covered with soil, and is located approximately 500 m south-east of bore 6/83. The site is down-gradient of the production bore and is not likely to be a significant risk to the town's water supply.

Furthermore, the Shire of Esperance is committed to minimising future impacts from the landfill, including leachate export. This entails necessary investigations, and inclusion of this site in the shire's Post closure management plan for small rural landfills.

3.2 Proposed land uses and activities

As outlined in section 1.4, the current drinking water source allocation is at its upper limit and this needs to be resolved to support future development in Condingup. There is a small but consistent demand for residential land in Condingup (two to three lots per year) with higher demand expected temporarily when land first becomes available. Additionally, there is scope for growth in terms of tourism, light industry and other commercial activities in the town (Shire of Esperance 2007).

The Shire of Esperance intends to release their draft *Town planning scheme 23* for public comment later this year (R. Hindley 2008, pers. comm., 20 March). The timing for preparation of this plan and the town planning scheme provide an opportunity for the scheme to reflect water source protection measures for Condingup (including priority areas and the wellhead protection zone). This will ensure that future development in Condingup is consistent with protection of the town's drinking water source.



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Figure 3 Land use and activities in the Condingup Water Reserve

Table 1 Land use, potential water quality risks and recommended protection strategies

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Town centre: residential school community/ sporting facilities tavern/general store	Nutrients and pathogens from septic tanks and leach drain systems Fertiliser and pesticide use on lawns, playing fields and gardens	High Medium	All private residences/public facilities in Condingup have septic systems. The closest septic system is about 50 m from bore 6/83. Minimal amounts of domestic chemical and fuel storage and use are expected in the town site. The primary school is adjacent to bore 6/83 and up-gradient of the groundwater flow to the bore. Monitoring data indicates no contaminant issues to date.	<ul style="list-style-type: none"> Water quality monitoring 	<ul style="list-style-type: none"> Continue current measures Encourage the use of appropriate alternative wastewater systems (to reduce nutrient and pathogen risks from septic systems) Best practice use/management of fertilisers, pesticides and herbicides
Light industrial	Hydrocarbon spills Chemical spills	Medium Medium	This area is about 700 m up-gradient of bore 6/83. There is some risk to the water source from this activity.	<ul style="list-style-type: none"> Water quality monitoring 	<ul style="list-style-type: none"> Continue current measures Best practice management approaches to operations (sections 4.5 and 4.6 list appropriate documents)

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Town oval	Fertiliser and pesticide use Nutrients and pathogens from septic tanks and leach drain systems	Low Low	Fertiliser and pesticide use is minimal at the oval which is down-gradient of the direction of groundwater flow to bore 6/83.	<ul style="list-style-type: none"> Water quality monitoring 	<ul style="list-style-type: none"> Continue current measures Best practice use/management of fertilisers, pesticides and herbicides
Roads	Hydrocarbon spills Chemical spills	Low Low	The Condingup Water Reserve contains a few local roads and is bound to the west by a rural access road. Bore 6/83 is about 20 m from the nearest road. Traffic levels are low and historically accidents and spills are rare.	<ul style="list-style-type: none"> Water quality monitoring HAZMAT emergency response 	<ul style="list-style-type: none"> Continue current measures

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Landfill <i>Current facility in operation</i>	Leachate containing chemicals	Low	<p>Landfill facility:</p> <ul style="list-style-type: none"> • uses a trenching system • is unlined • no personnel on-site • some recycling and sorting of waste. <p>It is about 1.2 km south-east of bore 6/83, down-gradient of groundwater flow to the bore.</p> <p>Decommissioned landfill is covered with soil and is about 500 m south-east of bore 6/83, down-gradient of groundwater flow to the bore.</p> <p>Given that these sites are down-gradient of the bore, they are not expected to influence the water source.</p>	<ul style="list-style-type: none"> • Water quality monitoring • DEC licensing • Monitoring bores (a condition of DEC licensing) 	<ul style="list-style-type: none"> • Continue current measures • Surveillance by Shire of Esperance staff <p>Shire of Esperance will investigate site's historical operation and include it in the shire's <i>Post closure management plan</i> for small rural landfills.</p>
	Leachate containing hydrocarbons	Low			
<i>Decommissioned</i>	Leachate containing pathogens	Low			

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Special rural	<p>Nutrients and pathogens from septic tanks and leach drain systems</p> <p>Fertiliser and pesticide use on lawns and gardens</p>	<p>Low</p> <p>Low</p>	<p>Special rural lots are down-gradient (south of) the direction of groundwater flow to bore 6/83.</p>	<ul style="list-style-type: none"> Water quality monitoring 	<ul style="list-style-type: none"> Continue current measures Encourage use of appropriate alternative wastewater systems (to reduce nutrient and pathogen risks from septic systems) Best practice use/management of fertilisers, pesticides and herbicides (section 4.5)
<p>Broadacre agriculture</p> <p>- <i>Plantation forestry, mainly Tasmanian blue gum (silviculture)</i></p> <p>- <i>Grazing (mainly cattle)</i></p> <p>- <i>Cereal cropping</i></p>	<p>Fertiliser and pesticide use</p> <p>Hydrocarbon storage</p>	<p>Low</p> <p>Low</p>	<p>Plantation forestry, low intensity stock grazing and cropping currently occur in the south of the water reserve. These activities are 750 m to 3 km down-gradient of the groundwater flow to bore 6/83 and are not expected to influence the water source.</p> <p>In addition, fertiliser and pesticide application rates are generally low, reducing the risk of groundwater contamination.</p>	<ul style="list-style-type: none"> Water quality monitoring 	<ul style="list-style-type: none"> Continue current measures Best practice use/management of fertilisers, pesticides and herbicides

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Crown land		Low	Two significant parcels of crown land within the water reserve contain large areas of local native remnant vegetation in good condition.	<ul style="list-style-type: none"> • Water quality monitoring 	<ul style="list-style-type: none"> • Continue current measures • Future land uses/activities to be compatible with Priority 1 water source protection status

4 Catchment protection strategy

4.1 Protection objectives

The key objective of this plan is to protect the groundwater resource in order to maintain a safe drinking water supply to consumers in Condingup. In achieving this objective, the department will recognise the rights of landowners for land uses and activities currently permitted in the proposed water reserve.

Protection strategies are recommended to avoid, minimise or manage risks. This particularly applies to contamination risks from existing land uses, due to the potential for contamination of the shallow unconfined to semi-confined groundwater source.

4.2 Proclaimed area

The Condingup Water Reserve was proclaimed in 1995 (Figure 2).

It was recognised during the preparation of this plan that the proclaimed water reserve area may not fully correspond with the recharge area for the production bore and possible future bores (within close proximity of the current bore). Given this, the plan recommends that a hydrogeological study be undertaken to consider the area and boundary actually required for the water reserve, and if proven necessary the water reserve boundary be redefined and re-proclaimed (Recommendation 7).

4.3 Priority areas

Land within public drinking water source areas is assigned a Priority 1, Priority 2 and/or Priority 3 (P1, P2 and P3) classification. These priority classifications take into account land use information, including zoning and ownership, the importance of the water source and its vulnerability from existing land uses.

Priority 1 protection is based on the objective of risk avoidance. Priority 2 protection is based on the objective of minimising risks to the water source. Priority 3 classification aims to manage potential risks to the water source.

The Condingup townsite, located in the north-western corner of the water reserve, contains a variety of land uses and zonings. Priority 1 classification is proposed for the predominantly vegetated crown land surrounding the townsite. Priority 2 classification is proposed for the townsite's special rural land. Priority 3 classification is proposed for the residential lots, the school and light industry/commercial activities within the townsite.

Priority 1 classification is also proposed for the large area of vegetated crown land south of the townsite. Priority 2 classification is proposed for the rest of the water

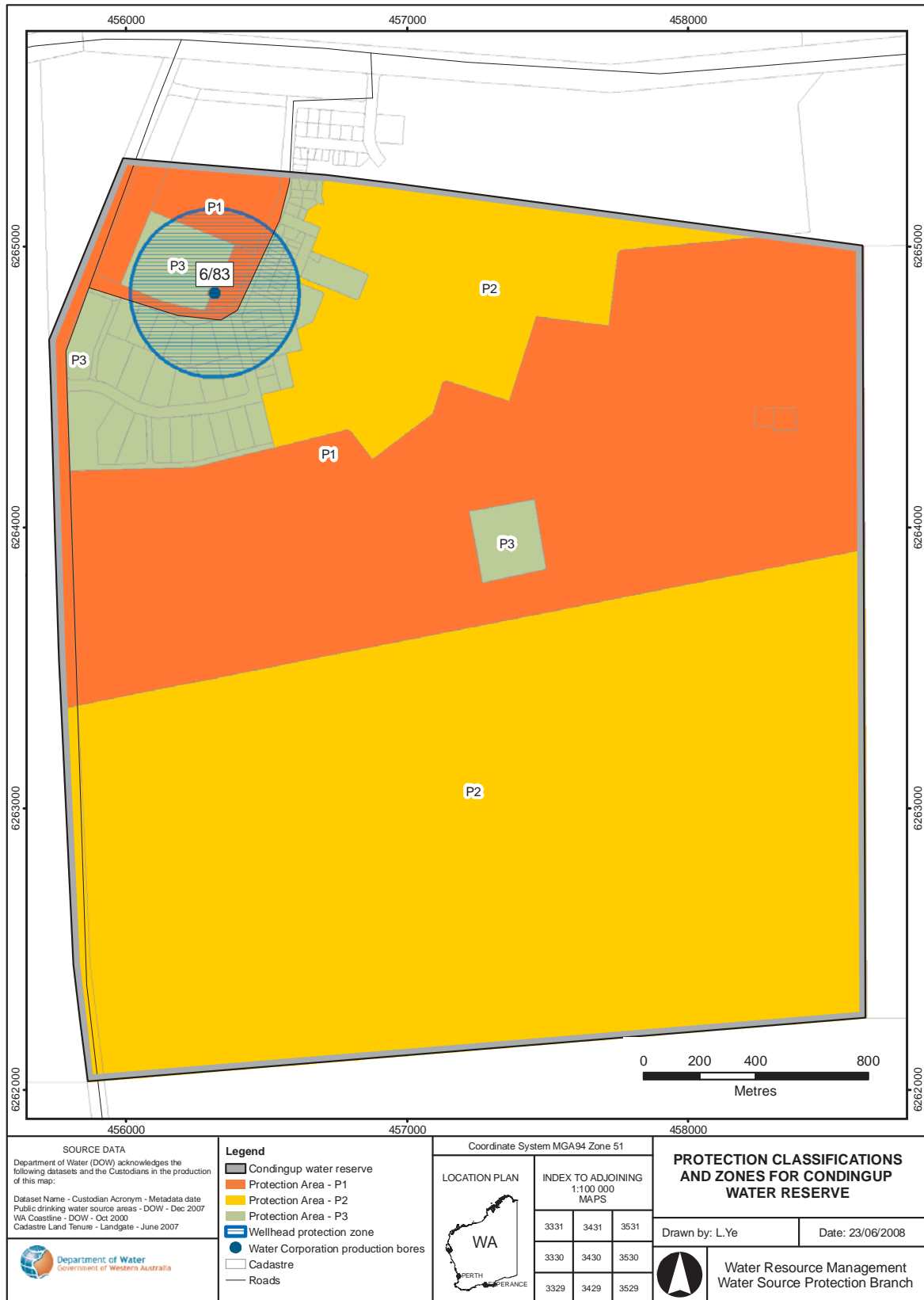
reserve that comprises rural land use, predominantly Tasmanian blue gum plantations and cattle grazing.

Figure 4 presents the proposed priority areas within the Condingup Water Reserve.

4.4 Protection zones

Wellhead protection zones are defined around production bores (500 m radius in Priority 1 areas and 300 m radius in Priority 2 and Priority 3 areas). The rationale for these zones is to ensure that activities in the immediate vicinity of bores are managed to protect against contamination of the water source. Accordingly, a wellhead protection zone (WHPZ) is proposed for Condingup's production bore 6/83, as shown in Figure 4.

It is noted that Condingup Primary School is within the WHPZ. In the light of this, consulting with school management will be a key part of the implementation strategy to be prepared (Recommendation 1), in order to minimise risks to water drawn from the production bore.



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Figure 4 Priority areas and wellhead protection zone for Condingup Water Reserve

4.5 Land use planning

It is recognised under the *State planning strategy* (Western Australian Planning Commission 1997) that the establishment of appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of drinking water sources. As outlined in *Statement of planning policy: Public drinking water source policy* (Western Australian Planning Commission 2003) it is appropriate that the Condingup Water Reserve priority classifications and protection zone be recognised in the Shire of Esperance's town planning scheme and other local/district land use planning strategies.

Any development proposals within the Condingup Water Reserve that are inconsistent with advice within the Department of Water's water quality protection note – *Land use compatibility in public drinking water source areas* or recommendations in this plan should be referred to the Department of Water.

The department's protection strategy for public drinking water source areas (PDWSA) provides for lawfully established and operated developments to continue despite their location or facilities posing a level of risk to water quality which would not be accepted for new developments. The department may negotiate with landowners/operators on measures to improve these facilities or processes to lessen the level of water contamination risk.

4.6 Best management practices

There are opportunities to significantly reduce risks to water quality by carefully considered design and management practices. The adoption of best management practices for land uses will continue to be encouraged to help protect water quality. On freehold land, the Department of Water aims to work with landowners to achieve best management practices for water quality protection by providing management advice.

There are guidelines available for many land uses in the form of industry codes of practice, environmental guidelines and Water quality protection notes. These have been developed in consultation with stakeholders such as industry groups, producers, state government agencies and technical advisers. Examples include Water quality protection notes on:

- *Land use compatibility in public drinking water source areas*
- *Agriculture – dryland crops near sensitive water resources*
- *Contaminant spills – emergency response*
- *Light industry near sensitive waters*
- *Tanks for elevated chemical storage*

- *Tanks for underground chemical storage*
- *Temporary skid mounted fuel transfer and storage in public drinking water source areas*
- *Protecting public drinking water source areas*
- *Rural restaurants, cafes and taverns near sensitive water resources.*

These documents assist business and land managers in reducing risks to water quality. The References and further reading section has details on how to access them on the department's website.

Education and awareness (for example, signage and information) are key mechanisms for water quality protection, especially for people visiting the area who are unfamiliar with the Condingup Water Reserve. A brochure will be produced describing the Condingup Water Reserve, its location and the main threats to water quality. This brochure will be available to the community and will inform people in simple terms about the drinking water source and the need to protect it.

4.7 Surveillance and by-law enforcement

The quality of public drinking water sources within country areas of the state is protected under the *Country Areas Water Supply Act 1947*. Declaration of these areas allows existing by-laws to be applied to protect water quality.

The Department of Water considers by-law enforcement, through surveillance of land use activities in PDWSAs, to be an important mechanism to protect water quality. This plan recommends that the delegation of the water reserve be formally delegated to the Water Corporation for this purpose.

4.8 Emergency response

Escape of contaminants during unforeseen incidents and the use of chemicals during emergency responses can result in water contamination. The Shire of Esperance Local Emergency Management Committee (LEMC) through the Goldfields–Esperance Emergency Management District should be familiar with the location and purpose of the Condingup Water Reserve. A locality plan should be provided to the fire and rescue services headquarters for the Hazardous Materials (HAZMAT) Emergency Advisory Team. The Water Corporation should have an advisory role to any HAZMAT incident in the water reserve.

Personnel who deal with WESTPLAN–HAZMAT (*Western Australian plan for hazardous materials*) incidents within the area should have access to a map of the Condingup Water Reserve. These personnel should have an adequate understanding of the potential impacts of spills on this water resource.

4.9 Implementation of this plan

Table 1 identifies the potential water quality risks associated with existing land uses in the Condingup Water Reserve and recommends protection strategies to minimise these risks.

Following publication of the final Condingup Water Reserve drinking water source protection plan, an implementation strategy will be drawn up based on the recommendations in Table 1. It will describe timeframes for the recommended protection strategies and identify responsible stakeholders. This is reflected in the recommendations section of this plan.

5 Recommendations

- 1 Prepare an implementation strategy for this plan, including the recommended protection strategies as detailed in Table 1 showing responsible stakeholders and planned time frames (*Department of Water in consultation with relevant stakeholders*).
- 2 The Shire of Esperance *Town planning scheme 23* should incorporate this plan and reflect the identified Condingup Water Reserve boundary, the Priority 1, 2 and 3 areas and the wellhead protection zone in accordance with the Western Australian Planning Commission's *Statement of planning policy: Public drinking water source policy (Shire of Esperance)*.
- 3 All development proposals within the Condingup Water Reserve that are inconsistent with the Department of Water's water quality protection note – *Land use compatibility in public drinking water source areas* or recommendations in this plan should be referred to the Department of Water for advice and recommendations (*Department for Planning and Infrastructure, Shire of Esperance, proponents of proposals*).
- 4 Incidents covered by WESTPLAN–HAZMAT in the Shire of Esperance should be addressed through the following:
 - the Shire of Esperance LEMC should be aware of the location and purpose of the Condingup Water Reserve
 - the locality plan for the Condingup Water Reserve is provided to the fire and rescue headquarters for the HAZMAT Emergency Advisory Team
 - the Water Corporation provides an advisory role during incidents in the Condingup Water Reserve
 - personnel dealing with WESTPLAN–HAZMAT incidents in the area have ready access to a locality map of the Condingup Water Reserve and information to help them recognise the potential impacts of spills on drinking water quality (*Water Corporation*).
- 5 Management of the Condingup Water Reserve to be formally delegated to the Water Corporation (*Department of Water*).
- 6 The existing surveillance program should be maintained to identify any incompatible land uses or potential threats within the Condingup Water Reserve (*Water Corporation*).
- 7 Signs should be erected along the boundary of the Condingup Water Reserve to define the location and promote awareness of the need to protect drinking water quality. Signs should include an emergency contact telephone number (*Water Corporation*).
- 8 A hydrogeological study be undertaken to consider the appropriateness of the water reserve area and boundary in terms of the recharge area of the current production bore and possible nearby future bores. Based on the results of the study, any required adjustments to the area of the water reserve should be made, including re-proclaiming the boundary of the reserve (*Department of Water*).

- 9 Planning for any future production bores that may operate within the water reserve should aim to locate these bore(s) within Priority 1 areas of the reserve (*Department of Water*).
- 10 A review of this plan should be undertaken after five years (*Department of Water*).

Appendices

Appendix A Water quality

The information provided in this appendix was prepared by the Water Corporation.

The Water Corporation has monitored the raw (source) water quality from the Condingup production bore in accordance with the Australian Drinking Water Guidelines (ADWG) and interpretations agreed to with the Department of Health. The raw water is monitored regularly for:

- aesthetic characteristics (non-health related)
- health related characteristics including:
 - health related chemicals
 - microbiological contaminants.

The following data is representative of the quality of raw water from the Condingup production bore. In the absence of specific guidelines for raw water quality, the results have been compared with the ADWG values set for drinking water, which define the quality requirements at the customer's tap. Results that exceed the ADWG have been shaded to give an indication of potential raw water quality issues associated with this source.

It is important to appreciate that the raw water data presented does not represent the quality of drinking water distributed to the public. Barriers such as storage and water treatment exist downstream of the raw water to ensure it meets the requirements of ADWG. For more information on the quality of drinking water supplied to Condingup, refer to the most recent Water Corporation *Drinking water quality annual report* at www.watercorporation.com.au/W/waterquality_annualreport.cfm?uid=2377-9937-9579-7091.

Aesthetic related characteristics

Aesthetic water quality analyses for raw water from Condingup Borefield are summarised in Table A1.

The values are taken from ongoing monitoring for the period April 2003 to April 2008. All values are in milligrams per litre (mg/L) unless stated otherwise. Any water quality parameters that have been detected are reported and those that have on occasion exceeded the ADWG are highlighted.

Table A1 Aesthetic related detections for Condingup Borefield

Parameter	Units	ADWG Aesthetic guideline value*	Condingup bore 6/83 SP	
			Range	Median
Aluminium unfiltered	mg/L	NA	<0.008–0.014	<0.008
Colour – True	TCU	15	<1–2	<1
Conductivity at 25 °C	mS/m	NA	115–180	160
Hardness as CaCO ₃	mg/L	200	59–81	70.5
Iron unfiltered	mg/L	0.3	0.006–0.188	0.02
Manganese unfiltered	mg/L	0.1	<0.002–0.016	0.002
pH	no units	6.5–8.5	5.81–6.83	6.42
Sodium	mg/L	180	240–325	295
Sulphate	mg/L	250	49–98	56.5
Total filterable solids by summation (TFSS)	mg/L	500	852–1080	954
Turbidity	NTU	5	<0.1–1.2	<0.1

*An aesthetic guideline value is the concentration or measure of a water quality characteristic that is associated with good quality water.

Health related characteristics

Health parameters

Raw water from Condingup Borefield is analysed for health related chemicals including inorganics, heavy metals, industrial hydrocarbons and pesticides. Health related water quality parameters that have been measured at detectable levels in the source between April 2003 and April 2008 are summarised in Table A2. Any parameters that have on occasion exceeded the ADWG are highlighted.

Table A2 Health related detections for Condingup Borefield

Parameter	Units	ADWG Health guideline value*	Condingup bore 6/83 SP	
			Range	Median
Arsenic	mg/L	0.007	<0.002–0.003	0.003
Barium	mg/L	0.7	0.001–0.002	0.00125
Boron	mg/L	4	0.18–0.24	0.21
Fluoride	mg/L	1.5	0.15–0.35	0.25
Nitrate as nitrogen	mg/L	11.29	0.085–0.61	0.18
Nitrite as nitrogen	mg/L	0.91	<0.002–0.006	<0.002
Nitrite plus nitrate as N	mg/L	11.29	0.085–0.36	0.18
Selenium	mg/L	0.01	<0.003–0.004	<0.003
Uranium	mg/L	0.02	<0.001–0.002	0.001

* A health guideline value is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHRMC & ARMCANZ 1996).

Microbiological contaminants

Microbiological testing of raw water samples from Condingup Borefield is currently conducted on a monthly basis. *Escherichia coli* counts are used as an indicator of the degree of recent faecal contamination of the raw water from warm-blooded animals. A detection of *Escherichia coli* in raw water abstracted from any bore may indicate possible contamination of faecal material through ingress in the bore, or recharge through to the aquifer (depending on aquifer type).

During the period of April 2003 to April 2008, *Escherichia coli* was not detected in any samples.

Appendix B Photographs



Photo 1 Banksia woodland on crown land adjacent to production bore 6/83 (note elevated water supply service tank in the background)



Photo 2 Typical broadacre agriculture activities in Condingup Water Reserve (note cattle grazing with plantation forestry (silviculture) in the background)



Photo 3 Condingup Community Centre

Glossary

Abstraction	The pumping of groundwater from an aquifer, or the removal of water from a waterway or water body.
ADWG	The <i>Australian drinking water guidelines</i> , outlining acceptable criteria for the quality of drinking water in Australia.
Aesthetic guideline	A water quality criteria in the ADWG associated with acceptability of water to the consumer, for example, appearance, taste and odour (NHMRC & NRMCC 2004a).
AHD	Australian Height Datum is the height of land in metres above mean sea level. For example, this is +0.026 m at Fremantle.
Allocation	The quantity of water permitted to be abstracted by a licensee, usually specified in kilolitres per year (kL/a).
ANZECC	Australian and New Zealand Environment Conservation Council.
Aquifer	A geological formation or group of formations able to receive, store and transmit significant quantities of water.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand.
Bore	A narrow, lined hole (also known as a well) drilled to monitor or draw groundwater.
CA	Catchment area.
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
cfu	Colony forming units. A measure of pathogen contamination in water.
DEC	The Department of Environment and Conservation (DEC) was established on 1 July 2006, bringing together the Department of Environment (DoE) and the Department of Conservation and Land Management (CALM).
ha	Hectare (a measure of area).
HAZMAT	Hazardous materials.

Health guideline	A water quality criteria in the ADWG associated with human health that, based on present knowledge, does not result in any significant risk to the consumer over a lifetime of consumption (NHMRC & NRMMC 2004a).
Hydrocarbons	A class of compounds containing only hydrogen and carbon, such as methane, ethylene, acetylene and benzene. Fossil fuels such as oil, petroleum and natural gas all contain hydrocarbons.
Hydrogeology	The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
kL	Kilolitre (1000 litres or one cubic metre).
km	Kilometre (1000 metres).
Leaching/leachate	The process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater. The material washed out is known as leachate. Leachate can pollute groundwater and waterways.
LEMC	Local Emergency Management Committee.
m	Metres.
mg/L	Milligram per litre (0.001 grams per litre) as a measurement of a total dissolved solid in a solution.
mL	Millilitre.
ML	Megalitre (1 000 000 litres = one million litres).
mm	Millimetre.
MPN	Most probable number (a measure of microbiological contamination).
NHMRC	National Health and Medical Research Council.
NRMMC	Natural Resource Management Ministerial Council.
Nutrient load	The amount of nutrient reaching the waterway over a given timeframe (usually per year) from its catchment area.

Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorous (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Pathogen	A disease producing organism that can cause sickness and sometimes death through the consumption of water, including bacteria (such as <i>Escherichia coli</i>), protozoa (such as <i>Cryptosporidium</i> and <i>Giardia</i>) and viruses.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
pH	A logarithmic scale for expressing the acidity or alkalinity of a solution. A pH below 7 indicates an acidic solution and above 7 indicates an alkaline solution.
Pollution	Water pollution occurs when waste products or other substances (for example, effluent, litter, refuse, sewage or contaminated runoff) change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses.
PSC 88	A state government circular produced by the Department of Health providing guidance on appropriate herbicide use within water catchment areas.
PDWSA (Public drinking water source area)	Includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> and the <i>Country Areas Water Supply Act 1947</i> .
Recharge	Water infiltrating to replenish an aquifer.
Recharge area	An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface.
Runoff	Water that flows over the surface from a catchment area, including streams.

Scheme supply	Water diverted from a source or sources by a water authority or private company and supplied via a distribution network to customers for urban, industrial or irrigation use.
Semi-confined aquifer	A semi-confined or leaky aquifer is saturated and bounded above by a semi-permeable layer and below by a layer that is either impermeable or semi-permeable.
Silviculture	Cultivation, management and harvesting of forest trees (in this context it refers to tree plantations). Also often described as plantation forestry or agroforestry.
Storage reservoir	A major reservoir of water created in a river valley by building a dam.
TCU	True colour units (a measure of degree of colour in water).
TDS	Total dissolved salts (a measurement of ions in solution, such as salts in water).
TFSS	Total filterable solids by summation.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment.
Unconfined aquifer	An aquifer in which the upper surface of water is lower than the top of the aquifer itself. The upper surface of the groundwater within the aquifer is called the watertable.
Water quality	The physical, chemical and biological measures of water.
Water Reserve	An area proclaimed under the <i>Country Areas Water Supply Act 1947</i> or the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> for the purpose of protecting a drinking water supply.
Watertable	The upper saturated level of unconfined groundwater.
Wellhead WHPZ	The top of a well (or bore) used to draw groundwater. A wellhead protection zone (WHPZ) is usually declared around wellheads in drinking water areas to protect the water source from contamination.
WESTPLAN– HAZMAT	<i>Western Australian plan for hazardous materials.</i>

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